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Recommended Citation

Martin, Brian, Research productivity: some paths less travelled 2009, 14-20.
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Research productivity: some paths less travelled

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Conventional approaches for fostering research productivity, such as recruitment and incentives, do relatively little to develop latent capacities in researchers. Six promising unorthodox approaches are the promotion of regular writing, tools for creativity, good luck, happiness, good health and crowd wisdom. These options challenge conventional ideas about research management.

Are there other ways?

Michael Lewis in his popular book *Moneyball* tells how Billy Beane, general manager of the Oakland Athletics baseball club, produced winning teams on a shoestring (Lewis 2004). With a budget far less than many other teams, Beane helped the Athletics succeed by going against conventional wisdom in player recruitment and game strategy. Rather than relying on the recommendations of scouts, who looked for certain characteristics in young players, Beane instead went with statistics and recruited players who were unfashionable, for example due to their style, size or shape. In game strategy, he relied on statistics compiled by enthusiastic amateurs.

The message from *Moneyball* is that the standard way of doing things may not be the best, and that collecting the right sort of data and following the numbers — and resisting instincts based on decades of experience — can reap huge rewards. A similar message emerges from the work of economist Steven Levitt, who has used data mining to challenge conventional policies and social explanations in a range of areas, from crime rates to choice of names (Levitt & Dubner 2005).

Does this message apply to research productivity? Are there different yet promising ways of promoting productivity?

Before addressing these questions, it is worth mentioning some conventional approaches. One is to appoint people who are or will become top researchers. This includes appointing proven performers, often at senior levels, and appointing promising new researchers, usually at junior levels.

Choosing the best candidate for a post, or headhunting a research star, is an everyday occurrence around the world. Often it is not done in the most effective fashion, for example due to biases based on familiarity, sex, ethnicity and age. The interview remains a mainstay of selection procedures despite evidence of its weaknesses (Grove et al. 2000; Meehl 1956). Few organisations test their recruitment strategies by carrying out long-term follow-ups of successful and unsuccessful candidates.

However, there's a more fundamental issue: recruiting better researchers can improve productivity for the hiring organisation, but it removes those researchers from their previous workplaces. There is only a net improvement in output, overall, if the researchers are more productive in their new jobs. Sometimes, successful researchers are hired into administrative roles with a detrimental impact on their research.

Another standard way to increase research productivity is to offer incentives such as teaching relief, promotions, higher status and praise. But there are associated costs. Giving a researcher a grant or teaching relief

may well increase that researcher's output, but there is an opportunity cost: there is less grant money for others and someone else has to do the teaching. Being promoted can be an incentive for doing research, but promotions mean higher salaries for the indefinite future. Some researchers lose their incentive after being promoted, especially when a further promotion seems unlikely. Even praise, which costs nothing, has an opportunity cost: dependence on praise can reduce intrinsic motivation (Kohn 1993).

Many researchers work long and hard because of the satisfaction of doing research, including developing and exercising high-level skills, discovering or developing knowledge, and being part of a socially worthwhile enterprise. For long-term productivity, intrinsic motivation is far more powerful than external rewards, because rewards have a declining impact: people adapt to new circumstances such as a higher salary, rank or prize, and soon treat them as the norm. Furthermore, external incentives can actually undermine intrinsic motivation.

Incentive systems set up a win-lose mentality: some are winners, receiving grants, promotions and recognition, whereas others are relative losers. This can be a disincentive to the losers, including many who feel shame at not measuring up to the high performance levels of colleagues and therefore would rather not try (Dweck 2006). Shame is a powerful and debilitating emotion in workplaces (Frost, 2003; Wyatt & Hare 1997).

Recruitment and incentives are two conventional ways to improve research productivity, but each has limitations. Are promising options being overlooked? What would a Billy Beane of research do with a limited budget trying to compete against well-financed competitors?

In the following sections I outline six unorthodox yet promising approaches: regular writing, techniques for creativity, fostering good luck, promoting happiness, promoting good health, and using the wisdom of crowds. In the conclusion I suggest some reasons why approaches to research productivity have been so circumscribed.

Writing

Writing is essential to research productivity: papers and books need to be completed. Publication is a key measure of research output because it is the way findings are communicated and placed on the record.

Research is commonly thought to follow a sequence like this: have an idea, find out what has been done

already, plan the investigation, carry it out, obtain findings and — at the end — write papers. Writing is seen as the final stage. It is, in this picture, just a way of expressing what has been done.

But there's another perspective: writing is a way of thinking. It is a way of developing, clarifying and testing ideas as well as expressing them. The implication is that writing should be done from the beginning of a research project.

Robert Boice (1990, 2000) spent many years investigating scholarly writing. A usual approach is writing in big blocks of time, when they can be found, which Boice calls binge writing. The trouble is that urgent small tasks eat up available time, so writing is postponed until weekends, holidays, semester breaks, sabbatical — or retirement.

Boice advocates a different approach: writing regularly, in moderation, perhaps 15 to 30 minutes every day, brief enough that undertaking a session does not seem daunting. He found, in one experiment, that new academics who learned to write in brief regular sessions produced four times as many polished pages per year as those who used their usual approach of relying on big blocks of time. Furthermore, those who were held accountable to Boice for daily writing had nine times the output of binge writers (Boice 1989). Tara Gray (2005), building on Boice's work, formulated a practical programme for writing and publishing that has been successfully implemented at several universities (Gray and Birch 2001). Boice's and Gray's approach is highly compatible with other advice on becoming a productive scholar (Johnson & Mullen 2007; Silvia 2007).

In this approach, writing is like exercise and the brain is like a muscle. Everyone has the same sorts of muscles and they respond to training in the same sorts of ways: daily training is far more effective in building strength and endurance than occasional lengthy sessions. Similarly, people's brains are similar in structure and, at all ages, respond to training (Restak 2001). Daily writing builds the capacity for further thinking and writing. Furthermore, Boice (1984) found daily writers had many more creative ideas than bingers who waited to write until they felt inspired.

Boice's findings are compatible with the view that the key to high-level performance in all sorts of fields is deliberate practice, over many years, with appropriate feedback (Ericsson 2006). From this perspective, expert performers are made, not born (Gardner 1993; Howe 1999). In this picture, the key trait associated

with productivity is not intelligence but perseverance (Hermanowicz 2005).

Boice's approach clashes with the common research management emphasis on highly productive researchers, often leaders of teams, commonly linked with an assumption that research performance depends on natural ability. With such an assumption, the goal is to recruit brilliant individuals and to foster them with suitable support and incentives. The daily writing regimen suggests that a much larger number of researchers can become prolific, given a suitable support system to promote development of habits that underpin high productivity.

Creativity

Research in every field requires some level of creative thinking, yet the process of creativity is seldom the focus of research management. Creativity is often thought of as a matter of inspiration that occurs mostly among certain right-brain-dominant individuals, especially in the creative arts. There is an alternative perspective: nearly everyone can become more creative by using practical techniques.

This approach has been fostered most prominently by Edward de Bono. Since developing the idea of lateral thinking decades ago, he has continued to propose new techniques for thinking in fresh ways, such as the six thinking hats, the six action shoes, the six value medals, the concept fan, provocation operations and random inputs. What these methods have in common is a goal of making creativity a practical process, achieved by using techniques designed to foster it in suitable directions (de Bono 1992).

De Bono's six thinking hats are a way of dividing up the process of thinking into discrete types that can be given attention separately (de Bono 1999). The white hat is concerned with information, the red hat with emotional responses, the black hat with critical judgement, the yellow hat with optimistic possibilities, the green hat with new ideas and the blue hat with process control, namely setting the agenda for thinking. In terms of these hats, most research uses only the white and black hats: information and criticism. Very little attention is given to emotional dimensions of research, new possible applications, creative thinking or the process of thinking itself. For example, referees for journal articles and grant applications typically devote most of their reviews to criticising shortcomings and hardly any to suggesting new directions or applica-

tions. De Bono (1995) argues that traditional Western thinking, based on truth-seeking and testing, needs to be supplemented by thinking emphasising change, design and creativity.

Researchers spend enormous efforts on acquiring data and testing ideas, and a large amount of research training is oriented to these tasks. Creativity is usually left unexamined. De Bono, among others (Claxton 1998), points to an alternative: turn creativity into a serious process, fostered with practical techniques that anyone can use. Prominent choreographer Twyla Tharp agrees, arguing that 'Creativity is a habit, and the best creativity is a result of good work habits' (Tharp with Reiter 2003, p. 7).

Luck

Researchers occasionally acknowledge the role of luck, giving it the multi-syllabic word serendipity and passing on stories of chemists who accidentally dropped test tubes and made a discovery after noticing unusual colours on the floor. Is good luck a matter of pure chance or are there ways to foster it?

Psychologist Richard Wiseman (2003) studied people who considered themselves lucky, testing them to discover which characteristic beliefs and behaviours might contribute to their good luck. In using the word luck Wiseman is not talking about winning the lottery — no laws of probability are being violated — but having good fortune, such as meeting someone who tells of a job opportunity.

Wiseman found that lucky people differ from unlucky ones in four main ways, which he calls principles of luck. The first is to create, notice and act on chance opportunities. An example is striking up conversations with strangers at a bus stop or supermarket. Random connections increase the odds of coming across a new idea or contact.

Wiseman's second principle is to listen to hunches and take active steps to improve intuition. Gut reactions can lead a researcher in a different direction than logical thinking, but gut instincts are not just emotional: they often draw on information unconsciously acquired and integrated. (Intuition is also valuable in protecting against danger (de Becker 1997).)

The third principle of luck is to expect good fortune. People who are optimistic and expect success are more likely to achieve it, a type of self-fulfilling prophecy in part triggered by positive expectations causing others to react more favourably. One aspect of this principle

is being persistent because of the belief in eventual success (Segerstrom 2006; Seligman 1998).

The fourth principle is to turn bad luck into good luck, for example seeing the benefits of ill fortune. For example, having a paper rejected might mean the opportunity to improve it and publish it in a more suitable journal.

Wiseman gives quizzes and exercises for highlighting attitudes relevant to luck and offers practical ways for adopting the beliefs and behaviours of lucky people.

Good luck need not be entirely a matter of fate but can be fostered. Researchers potentially have much to gain by using Wiseman's techniques. There are no guarantees but a lucky contact or propitious idea can make a huge difference in outputs and careers.

Happiness

Happiness is commonly seen as a goal, but it can also be a means to other goals — including research productivity. Despite images of suffering artists, happiness is more likely to promote research than reduce it.

Csikszentmihályi (1990) describes the state of 'flow' in which a person is so absorbed in an enterprise requiring full use of well-developed skills that time seems to pass without notice. Because research is one way to achieve flow, researchers will seek opportunities to enter this state, thereby increasing their output.

Happiness provides protection against unhealthy stress, which can occur in workplaces due to animosities, personal failure to measure up or even just hostile referee reports. Happy workers are more likely to be cooperative, with spin-offs for productivity.

Martin Seligman has been a driving force behind positive psychology, which examines how to foster better-than-normal mental states, in contrast to the usual focus in psychology on addressing mental dysfunction. Seligman (2002) describes ways to increase happiness by changing external conditions, such as having a rich social network and being religious. On the other hand, happiness is relatively unaffected by wealth (above poverty level), education, climate or objective measures of health.

At the level of individual psychology, beliefs about the future have a big effect on happiness. Happy people are

likely to be optimistic. They believe successes will continue but failures will be temporary, and that a success in one area will lead to success in other areas whereas failure in one area has no wider relevance. Happiness

therefore will be correlated with perseverance, a key to research success. An optimistic researcher will not be discouraged by failure and will be spurred on by success.

Seligman offers a detailed questionnaire to determine one's 'signature strengths,' namely one's characteristic

beliefs and behaviours that lay the basis for performance (Authentic Happiness, 2008). He recommends building on strength rather than spending too much time addressing areas that are weaker. The implication for researchers is to build on previous research strengths rather than tackling entirely new areas: few zoologists become top historians and vice versa. Working within or near one's area, using deliberate practice to address weaknesses within it and become even better, is likely to promote both happiness and performance and is compatible with what is known about expertise. Building on strength can also be used as an approach to organisational development, in the approach called appreciative inquiry (Watkins and Mohr 2001)

Happiness can be promoted at the individual level by developing different ways of thinking (Seligman 2002), at the group level through rituals of mutual support, recognition and congratulation, and at the level of society through policy-making oriented to happiness rather than materialism (Frey & Stutzer 2002; Layard 2005). However, happiness promotion within research organisations has hardly begun.

Health

Key elements in maintaining good health are exercise, diet, sleep and avoiding damaging habits such as smoking. Good health is worthwhile in its own right. Is it also good for research productivity? There are several connections.

People with healthy lifestyles are likely to have fewer illnesses and hence more time to do research. They are likely to have more energy, which can help maintain research effort. They are likely to live longer

Happiness provides protection against unhealthy stress, which can occur in workplaces due to animosities, personal failure to measure up or even just hostile referee reports. Happy workers are more likely to be cooperative, with spin-offs for productivity.

with less disability and therefore to have a lengthier research career.

Regular exercise has several beneficial effects. It counteracts the shrinking of the brain observed in sedentary individuals (Colcombe et al. 2003). It counteracts unhealthy stress. It is the single most effective means of improving one's mood (Thayer 1996). It helps prevent chronic disease (Kruk 2007). It can lengthen life expectancy by years and, more importantly, considerably increase the number of years of life adjusted for quality (Paffenbarger and Olsen 1996; Shephard 1997, pp. 310-324), which are likely to correlate with extra years of research productivity.

Good nutrition can improve brain function and help prevent disease, including intellectually debilitating mental conditions such as depression (Holford 2003). Getting plenty of sleep can improve daily performance and foster a more optimistic, cooperative attitude (Coren 1996; Dement 1999). Sleeping is vital to memory consolidation (Stickgold 2005) and may be more effective in problem-solving than extra waking hours. Many illnesses reduce the quality of sleep, so good health overall promotes better sleep and associated creativity.

Smoking is well known to reduce life expectancy, thereby reducing long-term productivity. Smoking may also reduce cognitive performance for complex tasks (Spilich et al. 1992).

Drinking large amounts of alcohol reduces mental performance in the short and long term. Alcohol is often used to relieve stress, but is not as reliable as exercise.

The available evidence supports the claim that a healthy workforce is a productive workforce. Promoting habits for a healthy life will make researchers more productive in the short term and keep them alive and capable for extra years of output.

Crowd wisdom

The success of open source software — of which the operating system Linux is the most well known example — shows that combining insights from a wide range of contributors can lead to a superior product (Weber 2004). Wikipedia entries are comparable in accuracy to those produced by experts (Giles 2005). These examples indicate the possible returns to research by attracting multiple voluntary contributors.

James Surowiecki (2004) in *The Wisdom of Crowds* reports on a wide range of evidence that combining

the independent opinions of many people can lead to better judgements than any individual, including the judgement of top experts. Note that the opinions need to be independent. This means asking each individual for a separate judgement and then aggregating the judgements — not getting together in a large committee.

According to Surowiecki, 'if you can assemble a diverse group of people who possess varying degrees of knowledge and insight, you're better off entrusting it with major decisions rather than leaving them in the hands of one or two people, no matter how smart those people are. If this is difficult to believe ... it's because it runs counter to our basic intuitions about intelligence and business' (p. 31). This argument is part of a wider promotion of peer-to-peer alternatives to conventional top-down decision-making (Foundation, 2008).

There are four conditions for crowds to make wise decisions: diversity of opinion, independence, decentralisation (so people draw on local knowledge) and aggregation. The production of open source software satisfies these conditions, but the US intelligence community doesn't because there is no means for combining information and judgements. An attempt to set up a decision market for intelligence purposes, with the market serving to aggregate independent judgements, was fiercely attacked by politicians (Surowiecki 2004, pp. 79-83).

Scott Page (2007) has run simulation experiments examining decision-making by groups. He finds that diversity of perspectives and skills within a group is crucially important for problem-solving, often as important as the ability of group members. Surprisingly, a group of the best individual performers may not do as well as a randomly selected group of good performers, because the randomly chosen group is more diverse.

Page's studies have profound implications for improving recruitment and collaboration strategies for research efforts. For example, it might be better to make appointments by aggregating independent assessments by a broad cross-section of academics, students and outsiders rather than rely on a small selection committee. Crowd-based decision-making could be used to pick promising areas for research breakthroughs. A research team could set up a decision market, in which members make bets on options, and make its plans based on the state of the market. It sounds weird, but it could be that the first academic groups willing to take the wisdom of crowds seriously

will be able to make wiser decisions than more prestigious peers.

Conclusion

Some standard approaches to fostering research productivity have limitations. Good appointments can improve an organisation's productivity but at the expense of productivity somewhere else. Incentives for research have opportunity costs and can reduce intrinsic motivations. It is worthwhile, therefore, considering unorthodox approaches. Six have been outlined here: regular writing, practical tools for creativity, techniques for fostering lucky breaks, promoting happiness, encouraging good health, and drawing on the wisdom of crowds.

These options are relevant to just about any researcher. For example, regular writing can help a low-output scholar produce more papers and help a high-output scholar produce an even more phenomenal number. Yet if there is a commonality in these options, it is that so-called ordinary researchers have a much greater capacity than usually recognised. This goes against the common assumption that some individuals are naturally talented and should be identified and given every encouragement — appointments, grants, less teaching, promotions, awards — to do more research.

The alternative perspective is that skills for doing research can be learned by just about anyone: the key is learning habits that train the brain into the necessary capacities (Doidge 2007) and believing that effort rather than talent is the key to success (Dweck 2006). This conclusion is compatible with the massive expansion of higher education, with more PhD graduates today, as a percentage of the population, than university graduates decades ago. It is also compatible with findings in sports, with high school students now routinely exceeding world records of a century ago. Many young musicians can today perform concertos only tackled by virtuosi of earlier eras. It is also compatible with popular advice about how to be well organised and personally effective (Allen 2001; Covey 1989).

To be sure, even with the best techniques, some individuals will demonstrate better performance than others. But how relevant is this to research progress generally? A slight advantage in skills may lead to a scientific breakthrough occurring a little bit earlier than otherwise. But if more researchers can be productive, this will increase the chance that someone will make

the breakthrough. Researchers whose creative skills have been fostered may find alternative approaches to the problem.

Finally, it is worth noting the side-effects of different approaches to research productivity. Selecting for talent and providing incentives fit into a competitive mindset, with the negative consequences of stimulating envy and discouraging those who lose out (Kohn 1986). In contrast, regular writing, techniques for creativity and using crowd wisdom are more likely to encourage a sense that everyone can be a valuable contributor. Good luck, happiness and good health are worthy goals in themselves.

Acknowledgements

I thank Scott Armstrong, Lee Astheimer, Michel Bauwens, Lyn Carson, Don Eldridge, Anders Ericsson, Bruce Martin and anonymous referees for valuable comments on drafts.

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